thus determined to be capable of expressing interstitial fluid. Site appropriateness will be described in greater detail below.

[0076] If the site has been characterized as having high flow according to the above described methods, a HbO/Hb ratio can then be determined, where such a ratio enables characterization of a site as either high flow and arterial/capillary (5a of Figure 1) or high flow and venous (5b of Figure 1). In other words, a site having a relatively or substantially high concentration of HbO to Hb is indicative of an arterial/capillary site and a site having a relatively or substantially low concentration of HbO to Hb is indicative of a venous site. Specifically, a hemoglobin ratio is determined based upon the above described equations, typically automatically by a microprocessor, where such a determination can then be compared to a predetermined or cut-off value such that a ratio value above the predetermined value is designated as a high ratio value and a ratio value below the predetermined value is designated as a low ratio value. As noted above, alternatively, the values may be compared to other tested sites such that the best site among those tested is chosen. Once arterial/capillary versus venous is determined, the site is then further characterized as being appropriate or not for a particular test (7 of Figure 1). In other words, if the particular test requires arterial/capillary sample, the potential sampling site will be determined to be appropriate if the HbO/Hb ratio is found to be high, thus it is determined to be capable of expressing substantially arterial/capillary sample, particularly high flow arterial/capillary sample. However, if the particular test requires venous sample, the potential sampling site will be determined to be appropriate if the HbO/Hb ratio is found to be low, thus it is determined to be capable of expressing substantially venous sample, particularly high flow venous sample. Site appropriateness will be described in greater detail below.

[0077] As described in detail above, in practicing the subject methods for hemoglobin characterization, whether HbO, Hb or total hemoglobin, light sources such as LED's, laser diodes, etc., irradiate a site, where the light sources irradiate the site with at least two different wavelengths, each of which ranges from about 400 to 1200 nm. A photodetector detects the absorbed light and the amount of each hemoglobin component can then be determined based on the specific absorbances of the wavelengths of interest, where such absorbances are then related to the particular hemoglobin component. More particularly, a device having the above described optical components, such as a device

described in detail below, may be used to practice the subject methods. As such, the device also is typically operatively coupled to a microprocessor working under the control of a software program such that the microprocessor is capable of performing all of the steps and functions necessary to characterize the hemoglobin of the site and also determine the appropriateness of the site for a particular test, for example the microprocessor is capable of performing all of the computations and/or comparisons necessary to determine oxygenated, deoxygenated and/or total hemoglobin values. As mentioned above, the above-described methods, the total hemoglobin and/or HbO/Hb ratio may be compared to a predetermined value or may be used as a comparison against other values from other tested sites to determine the best site amongst a plurality of sites testes. Additionally, the optical determination described herein may be in addition to, or instead of, other sample type characterization methods.

[0078] In certain other embodiments of the subject methods, hemoglobin characterization may be derived according to the methods described below, where the below described methods are of particular use where the path lengths and melanin concentrations are substantially constant from site to site and it is desirable to characterize the total hemoglobin concentration of a potential site.

[0079] Again by way of background, at a number of wavelengths such as 506.5, 522, 548,5, 586 and 815, HbO and Hb have the same molar extinction coefficients. If $\mathbf{R_{tot}}$ is measured at any of the wavelengths where HbO and Hb have the same molar extinction coefficients, the magnitude of $\mathbf{R_{tot}}$ will increase or decrease as total hemoglobin decreases or increases, respectively, based on the principle that **C** is substantially constant from site to site. Thus, in certain embodiments, total hemoglobin can be determined using the following equation:

[0080] (7)
$$\ln(R_{tot}) = C - 2\{ I_D[HbO](\varepsilon_{HbO} - \varepsilon_{Hb}) + I_D[Hb](\varepsilon_{HbO} - \varepsilon_{Hb}) \}$$
$$= C - 2\, I_D\, (\varepsilon_{HbO} - \varepsilon_{Hb})\, ([HbO] + [Hb])$$

[0081] Thus, for this particular embodiment, light of one wavelength irradiates a site, where such wavelength is chosen such that HbO and Hb have the same molar extinction coefficient. The absorbance or signal is then detected from the site and the total hemoglobin at the site is determined based upon the above described equation, where oftentimes the total hemoglobin concentration is determined automatically by a

microprocessor. More particularly, light from a light source such as an LED, laser diode, or the like irradiates a site with light of one wavelength, where the extinction coefficients of both HBO and Hb are the same. The absorbance or signal of the site is detected by a suitable photodetector or the like, where such absorbance is related to the total hemoglobin level of the site. Once total hemoglobin has been determined, the site is then further characterized as being appropriate or not for a particular test. In other words, for example, if the particular test requires interstitial fluid, the potential sampling site will be determined to be appropriate if the total hemoglobin site is found to be low, and the site is thus determined to be capable of expressing interstitial fluid. Site appropriateness will be described in greater detail below.

[0082] In yet another embodiment of the subject methods, hemoglobin characterization may be derived according to the methods described below, where the below described methods are of particular use where the path lengths and melanin concentrations are substantially constant from site to site and it is desirable to characterize a hemoglobin ratio of a potential site, e.g., HbO/Hb.

[0083] In this particular embodiment, two wavelengths are chosen to irradiate a site, where, at each wavelength, the two hemoglobin species have substantially different extinction coefficients, i.e., oxygenated hemoglobin and deoxygenated hemoglobin have different extinction coefficients. For example, suitable wavelengths where HbO and Hb have substantially different extinction coefficients include, but are not limited to, 431, 415, 555, 700 and 940 nm. That is, a first wavelength and a second wavelength are chosen, where each wavelength may be selected from the above described set of wavelengths so that HbO and Hb will have substantially different wavelength coefficients. The extinction coefficients at such suitable wavelength pairs have opposite deltas between the two wavelengths, i.e., as one increases between the first and second wavelengths, the other decreases between the first and second wavelengths. As such, the difference in $\mathbf{ln(R_{tot})}$ between the two wavelengths will increase as one hemoglobin component increases and will decrease as the other hemoglobin component deceases. In other words, for example, for each suitable chosen wavelength pair, as HbO increases, the difference in $\mathbf{ln(R_{tot})}$ between the two wavelengths will increase and as Hb decreases, the difference in $\mathbf{ln(R_{tot})}$ between the two wavelengths will decrease.

[0084] More specifically, from equation 5 above, modified for two wavelengths: